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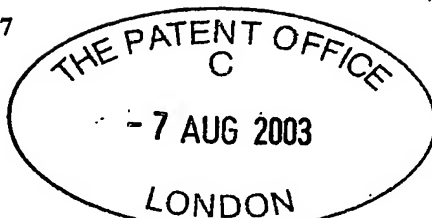
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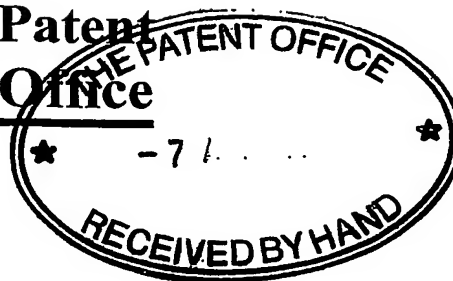
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Dated

20 August 2004



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08AUG03 E828727-1 D02837
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177

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1. Your reference

50482/

P709477GB/DRC

2. Patent application number

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0318584.0

57 AUG 2003

3. Full name, address and postcode of the or of each applicant (underline all surnames)

McGill Technology Limited
McGill Technology Building
Endeavour Park, London Road
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United Kingdom

Patents ADP number (*if you know it*)

6755417002

If the applicant is a corporate body, give the country/state of its incorporation

United Kindgom

4. Title of the invention

Mixing Apparatus

5. Name of your agent (*if you have one*)

"Address for service" in the United Kingdom to which all correspondence should be sent (*including the postcode*)

WITHERS & ROGERS
Goldings House
2 Hays Lane
London
SE1 2HW

Patents ADP number (*if you know it*)

1776001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number
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Date of filing
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Number of earlier application

Date of filing
(*day / month / year*)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (*Answer 'Yes' if:*

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Description 11

Claim(s)

Abstract

Drawing (s) 7

17 14

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Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature *W. R. Cowan* Date *6 Aug 03*

12. Name and daytime telephone number of person to contact in the United Kingdom

David R Cowan

01926 336111

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Mixing Apparatus

This invention relates to mixing apparatus and, in particular, to mixing apparatus whereby food product can be mixed prior to consumption.

5

It has been proposed to provide mixing apparatus, more particularly blending apparatus, in which a container of product fitted with a lid is blended by blending apparatus within the container.

- 10 The present invention is intended to provide improved apparatus for mixing food products and which is specially adapted to be cost effective and sufficient for one trip use.

According to the invention there is provided mixing apparatus comprising a container
15 base and a container lid, the container lid having mounted thereon mixing means, the mixing means extending through the lid and having, at one end, means for connection to a drive motor external to the container and, at the other end, a mixing element for mixing the contents of the container when the drive means is operated, the mixing means comprising a shaft portion locatable through an opening in the lid and
20 incorporating the connection means, and a mixing element portion assembled with the shaft portion for rotation therewith after the shaft portion is located in said opening.

In one arrangement, the mixing element portion includes an opening through which the shaft portion is located to lock into said opening.

25

The mixing means may be assembled on to the lid, the shaft portion being first inserted through one end of the lid opening, and then the mixing element portion is locked onto the shaft portion at the opposite end of the shaft.

- 30 It is also possible to have one piece mixing means which is assembled with the lid as one piece.

Preferably the mixing portion clips onto the shaft portion and is secured thereto by shoulder means on the shaft portion.

- 5 The container lid may comprise a rim portion with a circumferential slot into which the top edge of the container is located when the lid and the container are assembled.

The container lid may be formed with a downwardly and upwardly circumferential portion, the upwardly directed portion lying adjacent to the inner side wall of the
10 container base when the lid and the container base are assembled.

Within the upwardly and downwardly directed portion of the lid may be formed an outwardly convex curvilinear portion which includes the opening into which the mixing means is located.

- 15 Conveniently, the container lid is nestable or stackable with other container lids, one being located inside the other.

Container lids assembled with the mixing means are also, preferably, arranged to be
20 stackable or nestable.

Lubrication and/or cooling means may be provided to permit the contents of the container, during mixing, to contact and lubricate and/or cool the co-operating surfaces of the shank portion and the opening into the lid. Such lubricating means may include
25 longitudinal slots in the side walls of the opening which constitute a sleeve.

A container lid may include a product access opening with closure means so that, after completing a mixing operation, the opening is openable to access the contents.

- 30 The container lid may include holding means for holding product arranged to be mixed with the material in the container before, during or after operation of the mixing means.

The holding means may include a pocket having an opening for introducing the product into the pocket.

5 The pocket may have mesh means for permitting product in the container to enter into the pocket.

The pocket may be arranged to contain carbonation means for carbonating product in the container. Alternatively or in addition the pocket may contain flavour or other additives for the product.

10 Further features of the invention appear from the following description of various embodiments of the invention given by way of example and with reference to the drawings, in which:

15 Fig. 1 is a vertical cross section through one embodiment of mixing apparatus,

Fig. 2 is a vertical section corresponding to that of Fig. 1 of another embodiment,

Fig. 3 is a vertical section corresponding to those of Figs 1 and 2 of a further embodiment of the invention,

20

Fig. 4 is a perspective view of the underside of a lid for the mixing apparatus,

Fig. 5 is cross section on the line 5-5 in Fig. 4,

25

Fig. 5A is an enlarged detail of the cross section of Fig. 5,

Fig. 6 is a view corresponding to Fig. 4 showing the blending element disassembled from the lid,

30

Fig. 7 is a view of the lid of Fig. 4 from the opposite side, in perspective,

Fig. 8 is a plan view from beneath of a lid and blender element assembly of another embodiment of the invention,

Fig. 8A is a section on the line B-B in Fig. 8,

Fig. 9 is a view corresponding to Fig. 8 from the opposite side of the assembly,

Fig. 9A is a section on the line C-C in Fig. 9,

Fig. 10 is a perspective view of the assembly of Figs. 8 - 9 showing the blender element assembled,

Fig. 11 is a sectional view of a stack of assemblies of the kind shown in Figs. 8 - 10,

Fig. 12 is a scrap view of part of a lid, and

Fig. 13 is a similar view to Fig. 12 of an alternative arrangement.

Referring to the drawings and firstly Figs. 1 - 3, there is shown three versions of mixing apparatus of which each comprises common elements including a container or container base 10, usually in the form of a paper cup tapering inwardly towards the lower end 10A and having towards the upper end a rolled lip 10B. Instead of the container 10 being formed of paper, it may be of plastics, for example of injection moulded plastics.

In use, the container is assembled with a lid 12 which is fitted over the lip or rim 10B and carries assembled therewith a blending element 14 arranged for rotation relative to the lid 12.

The blending element 14 is rotated by a drive motor 40 having an upwardly directed drive shaft 41 arranged to engage with the blending element 14 for driving engagement during the blending operation.

In Figs. 1 - 3, the container 10 and assembled blending element 15 with lid 12 are shown inverted in a position in which product within the container is blended. In this position, the container is inverted with the lid 12 lowermost and the assembly is supported on an annular supporting member 42 which locates under the outer edge of the lid 12.

The container 10 is supported and seated in a tapered seating or holder 43 which is tapered to the outer shape of the container 10 and extends towards the upper end of the container so that the upper edge of the holder 43 engages under the container lip 10B. This arrangement of holder 43, shaped seating 43 and the upper edge of the lid 12 ensures in each case that the seal between the lid and the container is maintained through all stages of the operation of the blending apparatus, including when the container is inverted and when the blender is operating prior to blending, the container is located in the holder when upright or inclined towards the user.

Usually the holder 43 is initially in an upright or vertically inclined position with its wider end uppermost. The container 10 is located in the holder by dropping the assembled container and lid into the holder. The holder is then inverted to the position shown in which the lid is located onto the support 42 with the blending element 14 located over the drive motor 40. A downwards clamping force F is usually applied to the holder 43 to maintain it in its inverted position ready for a blending operation. The motor 40 is operated and the drive shaft 41 engages the blending element 14 through an opening 20 directed outwards from the lid 12. Rotation of the drive 41 causes the blending element 14 to rotate within product located within the container 10. This action blends the product or otherwise mixes it to ensure that it is adequately mixed or blended within the container.

When the mixing action has taken place for the required length of time, the clamping force F is released, the drive shaft 41 is disengaged from the blending element 14 and the cup holder with the container therein is removed from the support 42, inverted and released from the holder 43 and the product within the container is ready for consumption. As thus far described it is assumed that the contents of the container to be

blended are at the temperature and consistency required but, if necessary, the contents may be heated or cooled prior to the blending operation. In the case of product which needs to be heated, this may be achieved by directing microwave radiation at product within the container prior to or when in situ on the blending apparatus.

5

It will be seen that the embodiments of Figs. 1, 2 and 3 differ from each other primarily in the shape of the lid 12. Thus in the case of the Fig. 1 embodiment, the lid 12 is generally planar lying generally at a right-angle to the central axis of the container. The lid 12 is formed with a central circular opening 11 defined by downwardly, axially
10 projecting members 13 flanked by a depression 15.

In Fig. 2, the lid 12 is of more complex form, although still having an outer rim 13 and a central opening 11. In Fig. 2, the lid is formed with a part spherical central portion 12A in the middle of which is the opening 11, and the outer edge of the spherical
15 portion 12A is turned through approximately 180 degrees to form an outer portion 12B in alignment with and closely adjacent the inner walls of the container 10 towards the upper edge thereof. The semi-spherical portion 12A, as shown has a tangential portion 12C and the transition between the portions 12C and 12B is through right-angle bends at 12D. Alternatively, the bends 12D may be replaced by a curvilinear transition.

20

It will be seen that the portion 12D is below the level of the upper end of the container and that the semi-spherical portion 12A projects above the upper edge of the container and the portion 12A may provide a transparent region through which the internal part of the container may be viewed. It will also be noted that the region in which the blending
25 element 14 is operated, when in the inverted position, as shown is a partial sphere which assists in ensuring an efficient blending operation of product in the container.

The arrangement of Fig. 3 shows a further alternative form of lid 12, somewhat similar to the lid 12 of Fig. 2 but in which the semi-spherical portion 12A is of reduced
30 dimensions so that the upper end of the portion 12A lies substantially level with the upper end of the container 10.

The arrangement of Fig. 3 still provides a region in which the blender 14 operates which has curved lower surfaces to assist in ensuring an adequate blending action, and the lid may be of transparent material.

5 The embodiments of Figs. 2 and 3 are particularly useful in ensuring a good seating of the lid 12 on the container 10 to reduce the possibility of any leakage or unseating of the lid from the container. One way in which this is achieved is for the portion 12B of the lid 12 to extend along the inner side walls of the upper end of the container giving excellent sealing qualities and a seating within the container. This arrangement also
10 permits a minimal loss of capacity of the container and this can be overcome by allowing the portion 12A of the lid of the container to project beyond the upper end of the container. The use of a cup holder 43 further assists in maintaining a seal between the rim 10B and the lid 12, as shown enlarged in Figs. 1, 2 and 3. Details of the construction of the blender 14 and its associated lid are as described in relation to the
15 later described embodiments.

Referring now to Fig. 4 - 7, there is shown a lid 12 and associated blending element 14 of which similar parts are given the same reference numerals as in the preceding embodiment. The blending element 14 is of one piece construction and has a shaft 16 at
20 one end of which is an outwardly projecting lip 19. At the other end of the shaft 16 is located a set of blending blades 17 which extend generally radially outwards from the axis.

The shaft 16 is located into a central opening in the lid 12 and around the opening,
25 integral with the lid, are formed arcuate, axially-directed elements 30 which are circumferentially spaced from one another to leave gaps 31. Along each edge of each element 30 there is formed an angled surface 32 and by provision of the gaps 31 and the angled surfaces 32 there is provided means for admitting product within the container during blending into the small space between the shaft 16 and the elements 30. By this
30 means the outer surface of the shaft is lubricated and cooled. This may be necessary since the blending element 14 can be rotated at high speed during a blending operation and the shaft 16 is of relatively large diameter to provide structural strength to the

element 14. If product being blended is cold and the blending process is short, such lubrication may not be necessary but lubrication is desirable. Since the container is normally inverted during blending, the blending element 14 is immersed in the product and product gains access to the outer surface of the shaft 14. Such product provides a
5 film of lubricant/coolant between the shaft and the element 30.

The shaft 16 is located in the opening by applying axially directed pressure while entering the shaft 16 into the opening and when the lip 19 has extended through the opening it locates into a recess at the outer end of the opening to secure the blending
10 element to the lid. The outer end of the element 14 is formed with an internal depression and shape, as at 20, to enable the drive shaft 41 to enter and fully engage in the opening 20 and drive the blending element 14 during a blending operation. The fitting of the shaft 41 in the opening is intended to bring about a strong connection during vigorous blending, which may include blending ice cream masses.

15

In the arrangement of Figs 4 - 7, the outer rim 13 of the lid is formed with slits 34 extending in a generally axial direction from the rim 14 towards the top of lid. Such slits 34 assist in locating the lid on the container, the rim being able to be flexed outwards during such engagement. This may be of particular importance when the
20 container is made from paper/cardboard. This arrangement also has application when the lid is arranged to be fitted to containers which are of slightly different sizes since the flexibility provided by the slits permits the lid to be fitted to different size containers with different size rims. The slits may have a width of some 1 mm and extend to closely adjacent the inner edge of the rim.

25

Referring now to the lid assembly of Figs. 8-10, the same reference numbers are used for similar parts to those of the previous embodiments and the lid assembly of Figs. 8 - 10 corresponds with that of Fig. 3. It will be seen that the blender element is, in this case, formed of two portions (see in particular Fig. 10) of which one portion 14A is
30 termed a shaft portion and the other portion 14B is termed a blade portion. The shaft portion 14A is formed with a cylindrical portion 50 which is located within the opening in the lid defined by the elements 30 which together define bearing surfaces for the

blending element 14. At one end of the cylindrical portion 50 is a flange 51 which locates in the depression 15 formed around the central opening in the lid to thereby secure the blending element at one end thereof.

- 5 The portion 14A has a further cylindrical part 52 about which is located the bladed portion 14B of the element in use. Intermediate the portions 50 and 52 is provided a portion 54 in which can be seated the bladed portion 14B, when assembled.

In practice, the shaft portion 14A is inserted into the opening in the lid, then from the
10 opposite side of the lid is introduced the bladed portion 14B having a central opening 56 into which is inserted the portion 52. The bladed portion 14B is then pushed over the shaft portion 14A to locate the two portions together and the portions are then locked in position by engaging the inner edge of the opening 56 into a groove on the portion 54 or a shoulder is provided on the portion 52 over which the bladed portion 42 is located to
15 prevent release.

With this arrangement, the two portions 14A and 14B are locked together as one, after fitting to the lid 12 and are rotatable relative to the lid within the opening to enable the blending action to be performed.

20

The outer side of the blending element 14 lies flush with the upper surface of the lid to provide a neat appearance and, once assembled, the lids and blending elements are nestable together for transportation purposes, as seen in Fig. 11. To assist in such nesting together, there is provided lugs 56 against which the portions 12D of the lid is
25 arranged to engage.

In order to provide for easy access to product to be consumed from the container 10, the lid is provided with an openings 58 displaced to one side of the central axis and having to the upper open side a closure member 60 which locates into the aperture 58 and is
30 hinged at 62 to enable the closure 60 to be opened and closed according to the requirements of the user.

Referring now to Fig. 11, there is shown a series of lids of the kind illustrated in Figs. 8-9 which have been nested together after manufacture and assembly of the blending elements with the lids. The same reference numerals are used in relation to the same parts. It will be seen that the portions 12D locate in the gap between the portions 12C and 12B on an adjacent lid but the portion 12D engages up against lugs 56 whereby the lids may be readily denested from one another.

The shaft portions 52 of the blending elements locate within the opening at the drive shaft end of the blending element when nested together. Flat portions of the blades 17 of the blending element 14 rest against the upper surface of the lids at 12E to assist in enabling the lids to be nested and denested.

This nesting facility permits the assembled lids and blending elements to be transported occupying limited volume to a location where the lids are to be assembled on to the container bases.

Referring now to Fig. 12, there is shown a detailed view of part of a lid similar to that of Figs. 8 - 9 in which there is formed in the upper side of the lid in the region 12E a pocket 60 depending downwardly into the container and having opening 62 in the side walls giving access into the pocket from within the container. Towards the outer side of the pocket 60 is formed an opening 64 giving access into the pocket for a holder 66 which is shaped to be a close fit within the pocket 60, sealing the openings 62 and preventing product from passing out of the pocket 60 to the outside of the container. The holder 66 may contain any additive which is required to make to the product during mixing but, in particular, additives which when contacted by the products within the container will react with the product to create a desired effect. In one arrangement the holder 66 contains material which when contacted by the product will carbonate the contents of the container. Such carbonation will commence when product in the container reaches the opening 62 and enters the holder 66. Reaction between the contents and the carbonation material will set up a carbonation action and this will take place when the container is inverted and the contents blended.

Referring now to Fig. 13 an arrangement for a similar purpose to that of Fig. 12 is provided and the same references are used for similar parts. The arrangement of Fig. 13 primarily differs in that rather than the holder 66 sealing the opening 64, the equivalent holder 67 of carbonating product is located in a pocket 60 which is provided with a closure member 68 which seals the opening 64 at the upper end of the pocket 60.

The closure 68 is pivoted towards the side edge 13 of the lid to be moved about the pivot between an open condition, as shown, and a closed condition in which the closure 68 has been pivoted into position over the opening 64.

- 10 The holder 67 of this embodiment may be in the form of a liquid permeable bag and arranged so that upon contact by the contents of the container, the carbonation material is activated to release carbon dioxide into the body of the product.

- 15 During use of the container and lid assembly various means can be employed to ensure good fitting together of the units to avoid leakage and ensure integrity of the assembly.

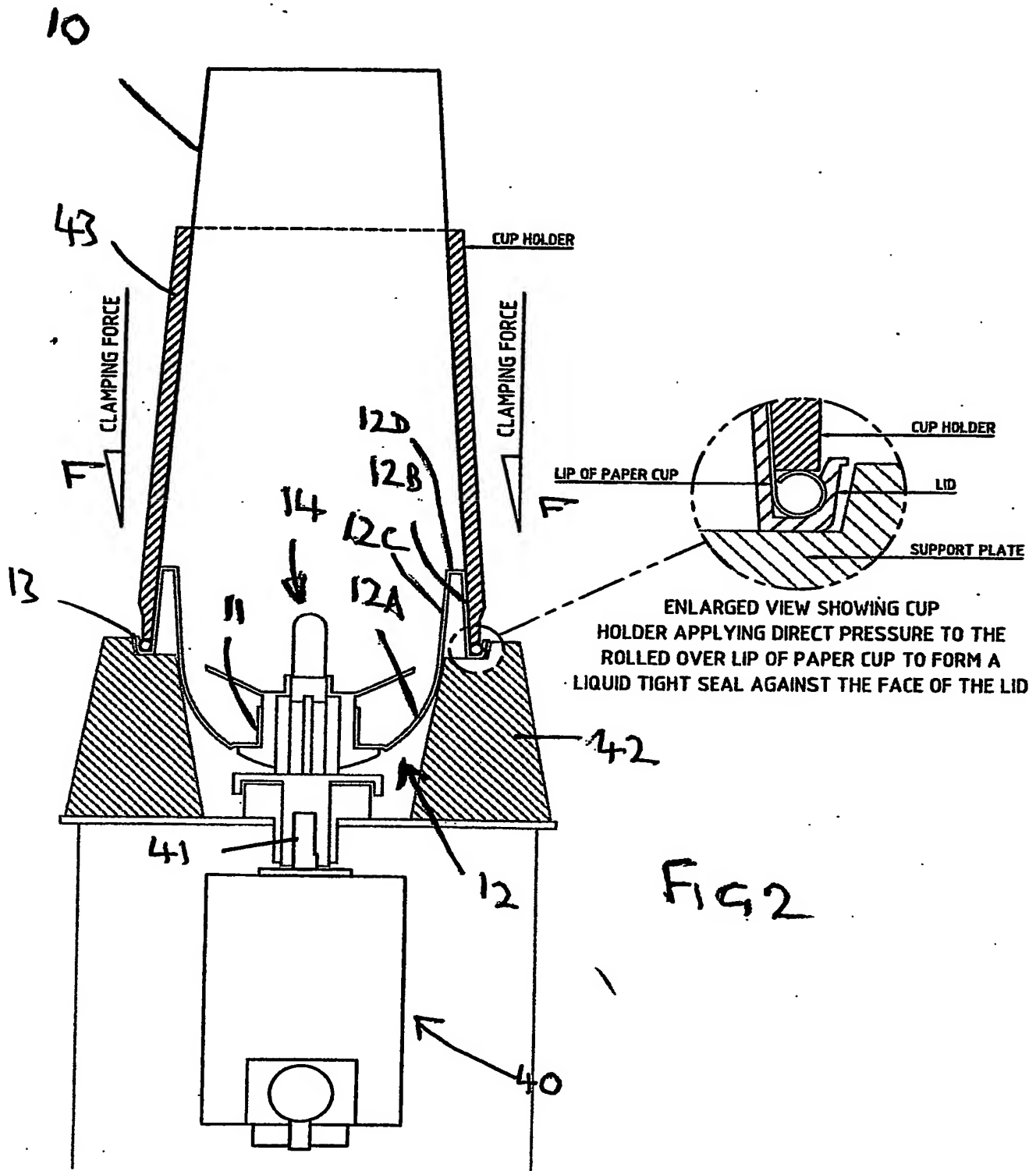
- 20 The fitting of the lid onto the container, as described, is intended to ensure this. Moreover rather than having to rely on the operator, the assembly can, at the filling location, or, if filling takes place at the dispensing location, be provided with a clamping mechanism whereby after the fitting the lid to the container a pressure plate or other clamp is applied between the ends of the container and lid until a predetermined pressure has been reached and this pressure is released. The assembly can then be inverted and the product is ready to be blended.

- 25 After fitting the lid to the container the parts may be united by heat sealing or otherwise.

Fig. 1

DETAIL SHOWING CLAMPING DIRECTLY
ONTO THE ROLLED OVER RIM OF CARDBOARD CUP
WITH FLAT LID DESIGN

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DETAIL SHOWING CLAMPING DIRECTLY
ONTO THE ROLLED OVER RIM OF CARDBOARD CUP
WITH HEMISPHERICAL LID

3/7

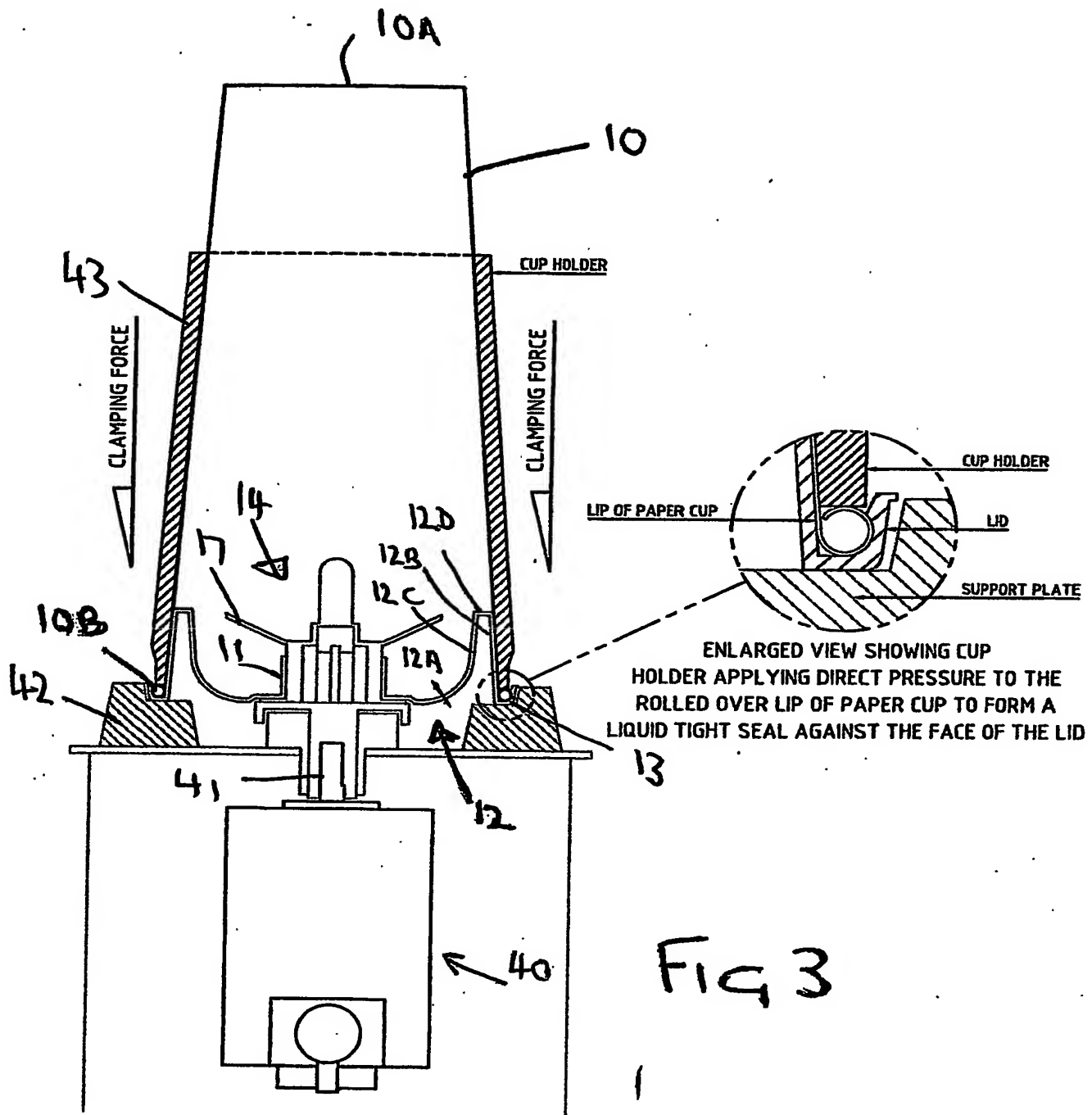


Fig 3

DETAIL SHOWING CLAMPING DIRECTLY
 ONTO THE ROLLED OVER RIM OF CARDBOARD CUP
 WITH RECESSED LID

4/7

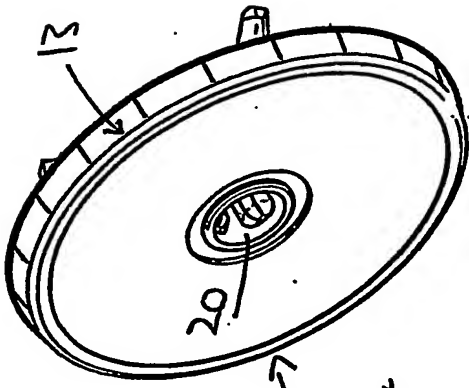


FIG. 7

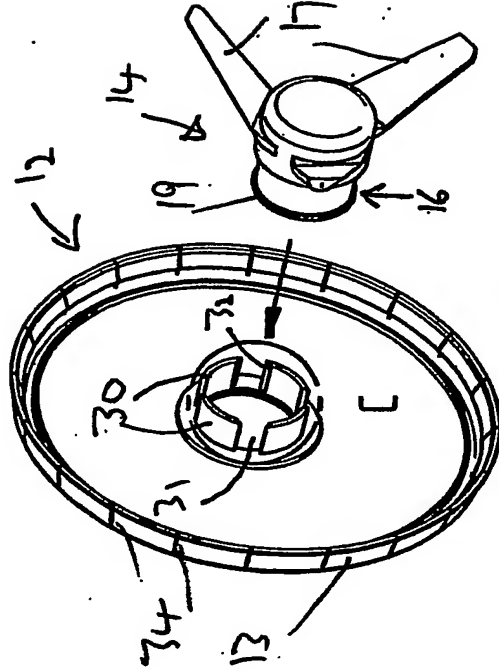
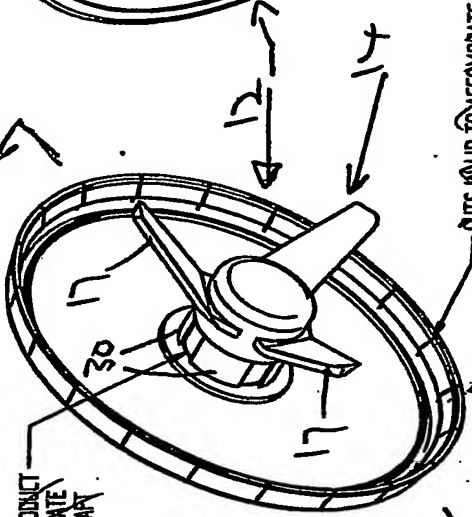


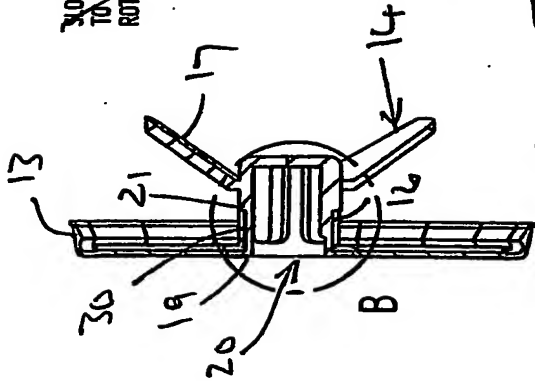
FIG. 6



CUTS IN UP TO ACCOMMODATE VARIATIONS IN CUR RIM SIZE

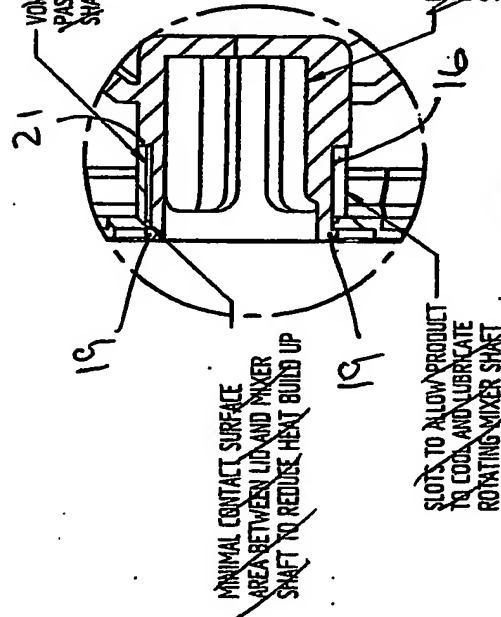
SLOTS TO ALLOW PRODUCT TO COOL AND LUBRICATE ROTATING MIXER SHAFT

FIG. 5



SECTION A-A

VOID TO ALLOW PRODUCT TO PASS FULLY AROUND ROTATING SHAFT



MINIMAL CONTACT SURFACE AREA BETWEEN LID AND MIXER SHAFT TO REDUCE HEAT BUILD UP

SLOTS TO ALLOW PRODUCT TO COOL AND LUBRICATE ROTATING MIXER SHAFT

DETAIL B FIG. 5A

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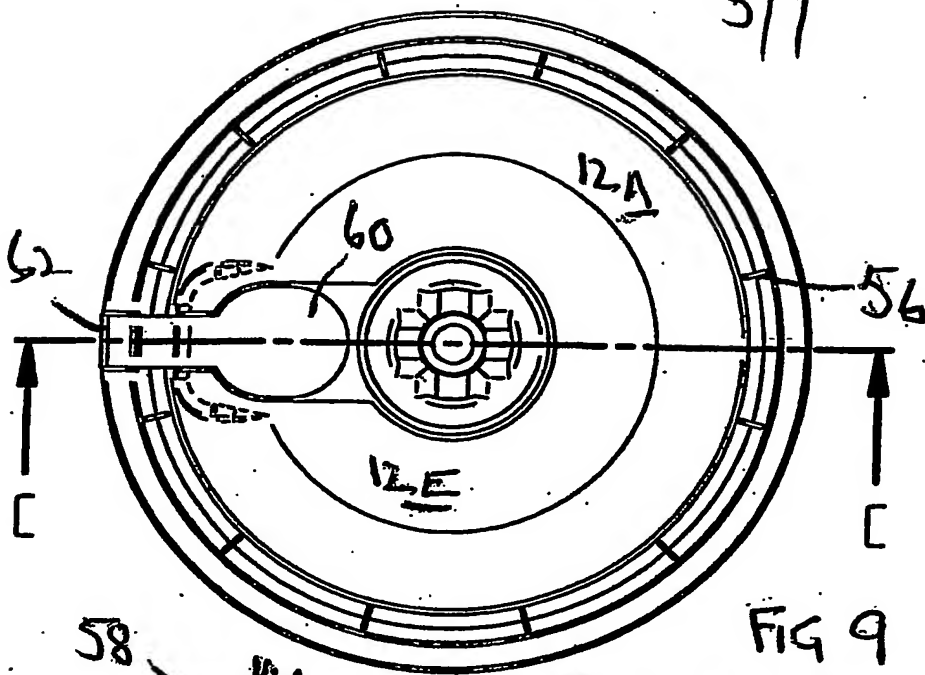


FIG 9

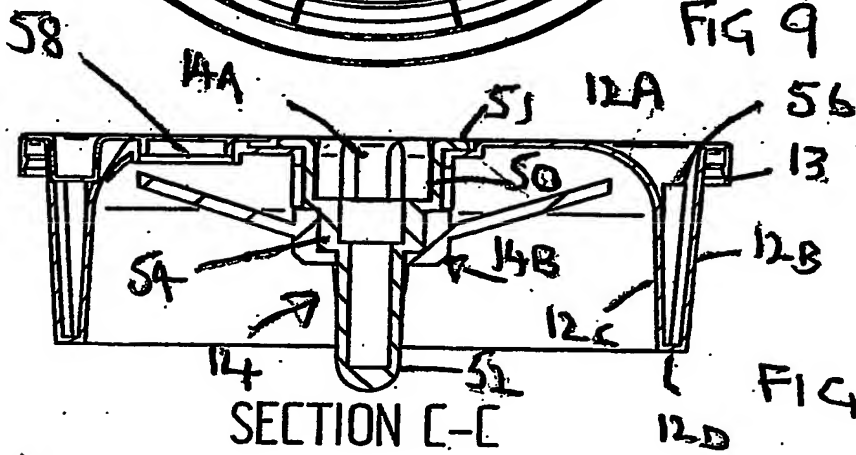


FIG 9A

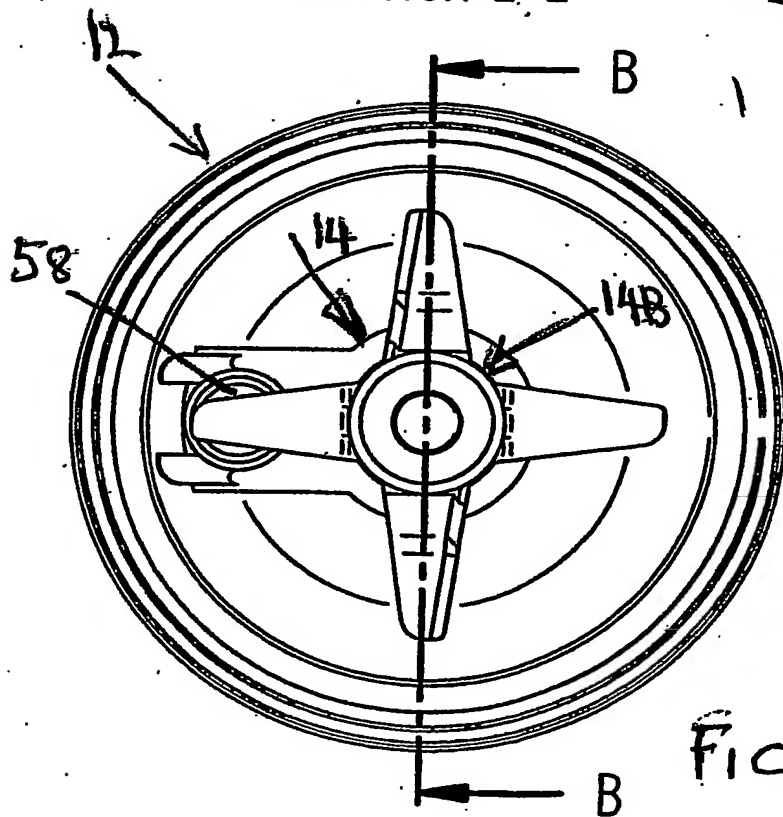


FIG 8

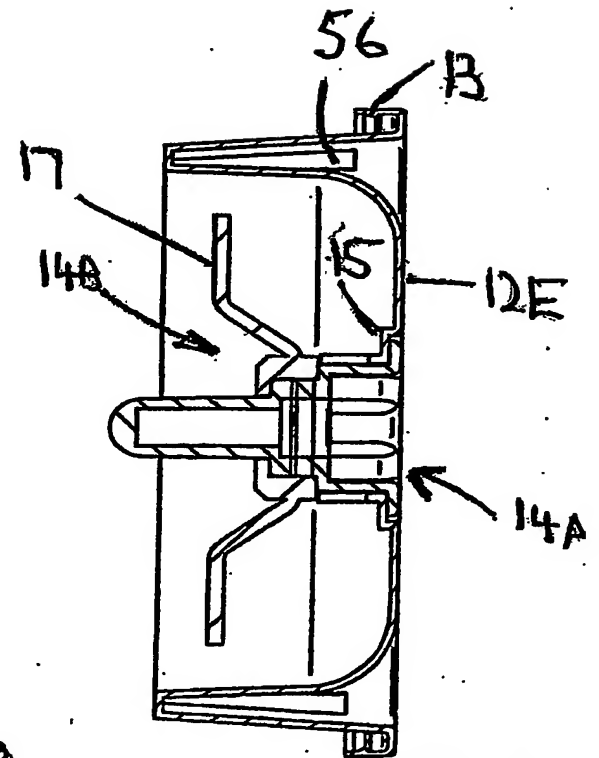


FIG 8A

SECTION B-B

ISOMETRIC VIEWS OF ASSEMBLED LID

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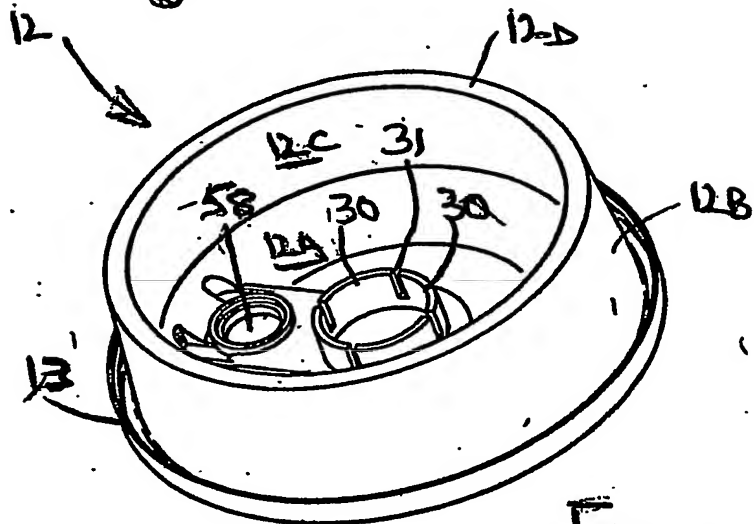
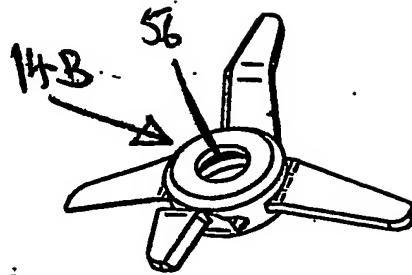


FIG 10

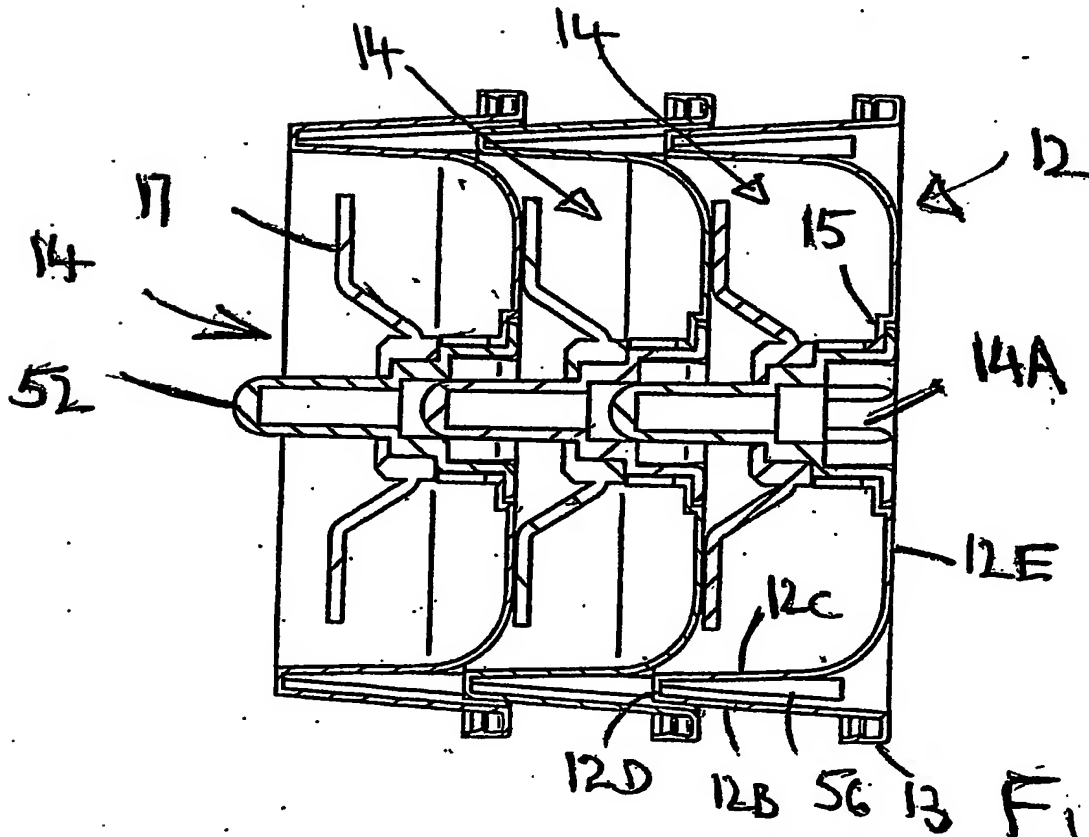
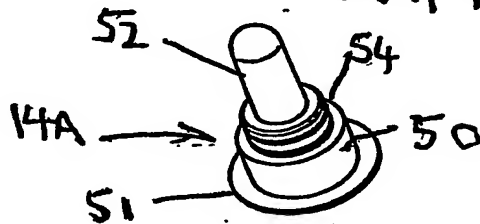
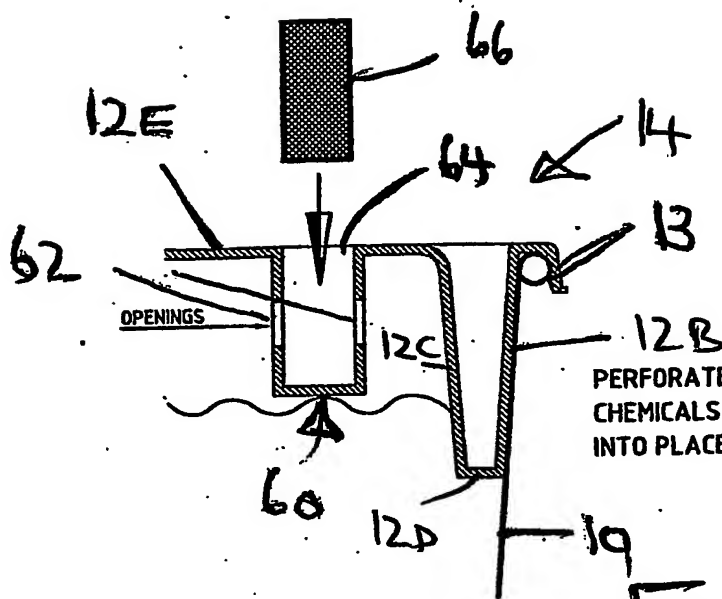


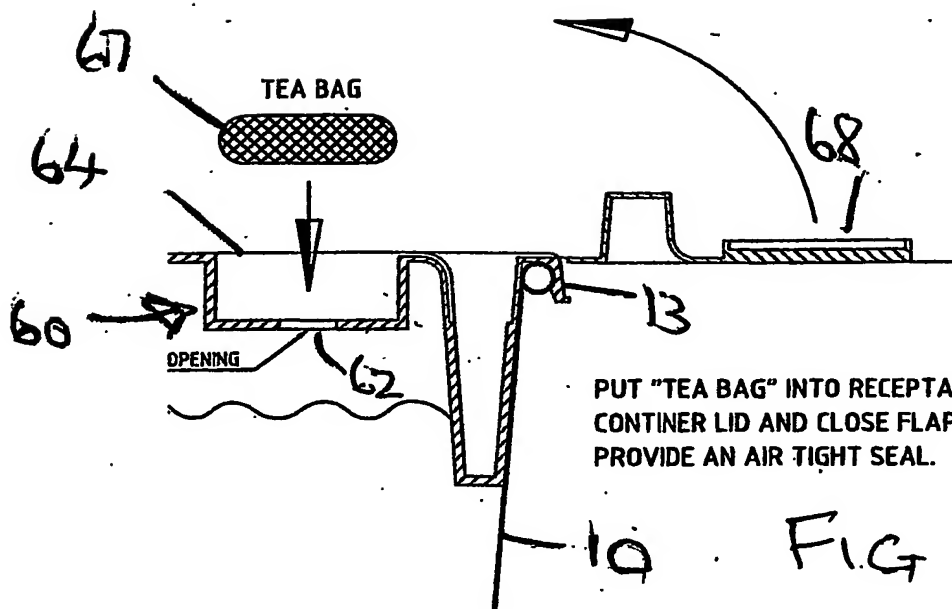
FIG 11

717



PERFORATED STICK CONTAINING CARBONATING
CHEMICALS IS PUSHED INTO RECESS SNAPPING
INTO PLACE FORMING AN AIR TIGHT SEAL.

FIG 12



PUT "TEA BAG" INTO RECEPTACLE IN
CONTAINER LID AND CLOSE FLAP TO
PROVIDE AN AIR TIGHT SEAL.

FIG 13